Remarks and Arguments

Claims 1 and 23-27, which are all of the independent claims pending in the application, have been amended to recite that the thermoplastic binder consists entirely or essentially of a thermoplastic polyethylene, polypropylene or ethylene propylene copolymer resin or combination thereof having flow properties at about 100 to about 150°C corresponding to an MI of about 2 to about 150 g/10 min. Support for the amendments is found in the definition of thermoplastic binders in the paragraph bridging pages 12 and 13 of the specification and in the further description thereof at page 57 line 31 to page 58 line 2 as preferably consisting entirely or essentially of thermoplastic resin, and at page 56 line 35 to page 57 line 11 describing preferred thermoplastic resins of the thermoplastic binders as having flow properties corresponding to an MI of about 2 to about 150 g/10 min. at about 100 to about 150°C.

Claim 5 has been amended to recite that the thermoplastic resin of the thermoplastic binder has flow properties at about 100 to about 150°C corresponding to an MI of about 5 to about 100 g/10 min., as described at page 57 lines 6-11 of the specification.

Claims 25 and 27 have been amended to add the term "thermoplastic" in reference to the binder and claim 25 has also been amended to recite that the thermoplastic binder is applied in solid form as a nonwoven fabric of continuous or staple fibers weighing about 1 to about 15 ounces per square yard and consisting entirely or essentially of the thermoplastic resin of the binder, support being found at page 22 lines 12-17 describing preferred thermoplastics with the recited weights per square yard and including nonwoven fabrics with continuous filaments and staple fibers.

In view of the foregoing, the amendments to the claims made herein are clearly supported in the description and do not constitute new matter.

Double Patenting

Claim 25 has been considered a substantial duplicate of claim 1 according to the outstanding action and subject to objection on allowance of the former. As amended herein, claim 25 recites that the thermoplastic binder is a nonwoven fabric weighing about 1 to about 15 osy, in contrast to the

broader scope of claim 1 with respect to forms and amounts of thermoplastic binder, and the claims are not substantial duplicates.

Claim Rejections – 35 USC 103

At the outset, Applicants note with appreciation that the obviousness rejections from the prior office action based on Bieser et al. as primary reference have been withdrawn.

Claims 1-4, 9-16, 18, 19, 21-27, 34, 35 and 38-45 have been rejected as obvious from US 3,684,600 (Smedberg) in view of prior art which the Examiner has considered as admitted. Reconsideration is requested.

As amended herein, none of the claims is obvious from Smedberg in view of the prior art that the Examiner considers to have been admitted. Smedberg is directed to a hot melt adhesive carpet backsize process, which is fundamentally different from the claimed process, including with respect to compositions, viscosities and application techniques. Smedberg's carpet laminating process uses a low viscosity hot melt adhesive formulation, not a thermoplastic binder consisting entirely or essentially of a thermoplastic resin with significantly more viscous melt flow properties. Smedberg also requires its adhesives to be applied as low viscosity liquids, in contrast to the solid forms of some thermoplastic binders according to the claims. There is no basis in Smedberg from which the improved fuzz resistance, often with accompanying improvements in tuft lock, achieved by use of stitch bind compositions in conjunction with thermoplastic binders according to the claims would have been expected by persons skilled in the art.

Smedberg's hot melt backsize adhesives have Brookfield viscosities of about 50,000 to 5,000 at application temperatures of 250-350°F (= 121-177°C) (Col. 7 lines 28-31) and are described generally as ethylene/vinyl acetate copolymer-based formulations that also contain one or more of a wax, filler and resin extender, and in which other types of resins, such as polyethylenes, ethylene/acrylate or ethylene/methacrylate polymers can be used instead of or in addition to the ethylene/vinyl acetate copolymer (Col. 6 line 66 to Col. 7 line 3).

Additional description and detail concerning application viscosities of hot melt adhesive formulations for carpet backsize processes are found in

patents and pending patent applications cited in Smedberg. US 3,551,231 cited at Col. 2 lines 22-41 of Smedberg for its teaching of a hot melt carpet backsize process representing an improvement over prior processes but still limited in terms of process flexibility, describes application viscosities of 8,000 to 15,000 cps for hot melt adhesive backsize compositions for most common commercial carpet applications (Col. 4 lines 3-7). In Table I, the patent reports an application viscosity of 10,000 cps at 320°F. Similarly, US 3,583,936, the application for which is cited both at Col. 7 lines 4-9 of Smedberg and in US 3,551,231 (Col. 3 lines 36-48) for its description of "particularly preferred compositions" for hot melt adhesive carpet backsize compositions, teaches that the compositions are applied at temperatures of 220-340°F and should have a Brookfield viscosity (spindle #7; 50 rpm) of about 1,000-15,000 cps within that temperature range. A later patent of Smedberg, US 3,745,054, also related to hot melt adhesive carpet backsize formulations and processes, reports viscosities of 5,680 to 35,200 cps at 250-350°F in its examples, specifically describing application viscosities of 10,000 to 15,000 at 310°F as optimum for carpet manufacture (Col. 2 lines 45-47). Referring to formulations corresponding to Smedberg's particularly preferred compositions from US. 3,583,936, the patent also teaches their viscosities are too high if filled with more than 45% filler (Col. 1 lines 61-66) and that a 310°F application viscosity of 49,000 cps is "excessively high" (Col. 2 lines 48-64).

All of these patents are directed to hot melt adhesive carpet backsize formulations and processes and are consistent in their teachings of low application viscosities of their hot melt formulations. Smedberg's 50,000-5,000 cps range includes viscosities higher than those according to the other patents and, according to the later Smedberg patent, US 3,745,054, its upper limit is excessively high. Even accepting Smedberg's upper limit at face value, however, the application viscosities of the hot melt adhesives according to these patents is about an order of magnitude lower than the viscosities of the thermoplastic binders according to Applicants' claims as indicated by the flow properties recited therein.

With regard to composition of the low viscosity hot melt adhesives for Smedberg's hot melt backsize process, Smedberg generally describes hot melt adhesive carpet backsizes as ethylene/vinyl acetate copolymer-based

formulations that also contain one or more of a wax, filler and resin extender, and in which other types of resins, such as polyethylenes, ethylene/acrylate or ethylene/ methacrylate polymers can be used instead of or in addition to the ethylene/vinyl acetate copolymer, stating as follows at Col. 6 line 66 to Col. 7 line 3:

> "A variety of hot melt adhesives are useful as the backsizing composition in the present process. While such adhesives can consist solely of a polymeric binder resin, such as an ethylene/vinyl acetate copolymer, for economic reasons they generally include substantial quantities of other ingredients. Thus, in addition to a polymeric binder resin, useful adhesive compositions generally contain at least one of the following ingredients: waxes, fillers, and resin extenders. Also, in addition to or in place of ethylene/vinyl acetate resins other types of binder resins such as polyethylenes and ethylene/acrylate or methacrylate copolymers can be used."

Following this listing of possible ingredients, Smedberg describes useful hot melt adhesive formulations, with reference to US 3,390,035 and the application that matured into US 3,583,936, as containing about 10-35 wt% ethylene-lower vinyl ester, -lower acrylate or -lower methacrylate copolymer, about 10-25 wt% high melting point wax and about 50-70 wt% of a blend of an aliphatic thermoplastic hydrocarbon resin and a dicyclopentadiene alkylation polymer and up to about 45 wt% filler (Col. 7 lines 4-27).

Consistent with Smedberg, the hot melt adhesives described in US 3,390,035 include ethylene-vinyl acetate and wax as essential components and preferably filler in an amount up to 50 wt% (Col. 1 lines 40-51; Col. 4 line 71 to Col. 5 line 62). Smedberg's particularly preferred compositions as described in US 3,583,936 (also discussed above with regard to viscosities) include as "essential ingredients" ethylene copolymers with vinyl esters of lower carboxylic acids, a wax with a suitably high melting point and a resin extender that is a blend of a base resin and a modifying resin. That patent also discusses the importance of proportional amounts of those components, expressly teaching that application temperature viscosities of the adhesive are too high at ethylene copolymer contents above 35 wt.% and that application viscosities increase with less than 50-70 wt.% resin extender component (Col. 4 line 70 – Col. 5 line 15). US 3,551,231, also cited in Smedberg and discussed above in regard to viscosities, also cites the application that

matured into US 3,583,936 for its disclosure of particularly preferred hot melt adhesive carpet backsizes, describing formulations with 10-35 wt% ethylene-vinyl acetate copolymer, about 10-25 wt% petroleum wax and 50-70 wt% resin blend, usually with filler in amounts up to 45 wt%. US 3,745,054 to Smedberg, also discussed above with regard to viscosities, describes hot melt adhesive carpet backsize compositions formulated from ethylene/lower vinyl ester copolymers, waxes, low softening point resin extender blends and inorganic fillers (Col. 2 lines 25-44, Col. 3 line 1 – Col. 4 line 45).

The hot melt adhesive formulations described as useful carpet backsize adhesives in Smedberg and all of the patents it cites include at least ethylene-vinyl ester or -acrylate or -methacrylate copolymer and wax in their formulations and, in many cases, additional resin extender blends and inorganic fillers. Those formulations are not thermoplastic binders consisting essentially or entirely of a thermoplastic polypropylene, polyethylene ethylene propylene copolymer resin or combination thereof, as recited in the claims of the subject application.

Smedberg's teaching at Col. 6 line 66 to Col. 7 line 3 has been interpreted as a teaching of hot melt adhesives comprising polyethylene or entirely polyethylene according to pages 12 and 13 of the outstanding action. From the preceding discussion, however, it is clear that the interpretation is inconsistent with Smedberg and the patents it cites. From the ethylene-vinyl ester, -acrylate or -methacrylate copolymers and waxes required according to the patents, the isolated passage relied on in the rejection cannot fairly be considered a teaching from which persons skilled in the art would understand that a hot melt adhesive carpet backsize composition useful according to Smedberg would contain a polyethylene as its only thermoplastic resin or would contain only a polyethylene. In this regard, Col. 3 lines 25-36 of US 3,551,231 is also instructive, describing hot melt ingredients in language almost identical to that of Smedberg relied on in the rejection but clarifying that a polyethylene might be included in addition to, but not instead of, ethylene-vinyl acetate copolymer:

> "A variety of hot melt adhesive compositions are useful in practicing the process of the present invention. While such adhesives can consist solely of a polymeric binder resin, such as an ethylene/vinyl acetate copolymer, for economic reasons they generally include substantial

quantities of other ingredients. Thus, in addition to a polymeric binder resin, useful adhesive compositions generally contain at least one of the following ingredients: waxes, fillers, and resin extenders. Also, **in addition to ethylene/vinyl acetate resins** other types of resins such as polyethylenes and ethylene/ acrylate or methacrylate copolymers can be used." (Emphasis added.)

From the foregoing, it is clear that the process claimed in the subject application differs significantly from Smedberg at least with respect to the viscosities and compositions of the binders used in the respective processes. Smedberg is not a thermoplastic binder process and does not disclose or make obvious the binders used in such processes.

Submitted herewith is a Declaration of Dr. Hugh Gardner, an inventor in the subject application, establishing significant differences between the thermoplastic binders and their use according to the subject application and the hot melt adhesive backsize process and compositions according to Smedberg as understood by one skilled in the relevant art. As seen from Dr. Gardner's Declaration, the claims are clearly different and nonobvious from Smedberg in view of fundamental differences between the application viscosities, compositions and manners of using the claimed thermoplastic binders as compared to Smedberg's hot melt adhesives, together with the unexpected improvements in fuzz resistance, and often in fuzz resistance and tuft bind, attained according to the claimed process.

In view of differences between the compositions and viscosities of the thermoplastic binders according to the claimed process and those of Smedberg's significantly lower viscosity hot melt formulations, the purported application of the prior art considered admitted by the Examiner to find obviousness in applying Smedberg's adhesives as by extrusion or melting a binder applied in solid form is inappropriate and incorrect and, in any event does not lead to the claimed process. The viscosities of Smedberg's hot melt compositions used as carpet backsizes are conducive to application with roll applicator systems but not to spinning fibers for nonwoven fabrics or extrusion of films and coatings.

The analysis of Smedberg in reference to claims 9-12, 35, 40, 42, 43 and 45 in the paragraph bridging pages 4-5 of the outstanding action is irrelevant in view of the fundamental differences between the reference and

the claims as discussed above and established in the accompanying Declaration of Dr. Gardner. Contrary to the position of the rejection that Smedberg is not limited to particular primary backings and face yarns and therefore is considered to make any backing and face yarn type obvious, Smedberg's hot melt process is limited to a particular type of binder and methods for using it that are sufficiently different from the claimed process that Smedberg would not reasonably be accorded suggestive or predictive value by persons skilled in the art regarding results of the claimed process with carpet components not even mentioned in Smedberg.

Claims 1-4, 9-16, 18, 19, 21-27, 34, 35 and 38-45 have also been rejected as obvious over the prior art which the Examiner considers to have been admitted, as described in the paragraph bridging pages 5 and 6 of the outstanding action, in view of Smedberg. This is the same rejection as that discussed above except Smedberg has been relegated to a secondary reference and its process deemed an obvious way to solve the fuzzing problem in carpets made with thermoplastic binders, which the rejection characterizes as part of the admitted prior art. Reconsideration is requested.

Application of Smedberg's precoat teachings to the specification's discussion of problems with carpets made using thermoplastic binders does not make the claimed invention obvious for the same reasons discussed above and in the accompanying Declaration of Dr. Gardner. There are fundamental differences between Smedberg's hot melt adhesive carpet backsize compositions and process and the claimed process and thermoplastic binders, such that Smedberg's teachings regarding use of its precoats in its hot melt backsize process cannot reasonably be extended to thermoplastic binder processes, and even if they were, it would not lead to the claimed process or any expectation of the results attained thereby. In any event, if the fuzzing problem to which Applicants' invention is directed is considered admitted prior art, continued existence of that problem, despite Smedberg's public availability as an issued patent since 1972, clearly bespeaks of Smedberg's ineffectiveness as a solution to fuzzing and, it logically follows, of nonobviousness of the claimed process.

Smedberg itself teaches against the broad application of its teachings advanced in the rejection. Combined application amounts of both hot melt

adhesive carpet backsize and precoat adhesive are important to overall carpet properties according to the reference (Col. 7 lines 35-42). Precoat amounts themselves vary significantly depending on whether they are applied as hot melts or as aqueous latexes (Table 2; Col. 7 lines 42-55). Further, in contrast to Smedberg's general statement that precoat viscosities are 2-2000 cps, with 80-110 cps being preferred (Col. 5 lines 18-20), the reference itself describes and demonstrates acceptable fuzz resistance only at 43-155 cps according to Table 1 and the description thereof at Col. 4 line 10 to Col. 5 line 19. With these specific teachings of Smedberg regarding importance of combined backsize and precoat application rates within its own hot melt adhesive backsize process, variations in application levels of each depending on form of the precoat, and successful results over only a narrow range of viscosities, motivation for persons skilled in the art to extend Smedberg's precoat teachings beyond its own hot melt adhesive backsize process is clearly lacking. Even if applied, there is no guidance as to how.

From the examples of the subject application, it also can be seen that improved fuzz resistance was attained according to the claimed process over a considerably broader range of carpet styles, face yarn types and weights and with greater consistency than in Smedberg's examples. Further, in contrast to Smedberg's showing that scrim bonds for all of its examples were less than the 27 lb/in^3 in precoat-free example IV, and that all but two of its examples with precoat were below 20 lb/in^3, Examples 3-37 of the subject application show that the improved fuzz resistance achieved according to the claimed process was in almost all instances accompanied by increases, and frequently significant increases, in tuft lock as compared to controls using thermoplastic binders without stitch bind compositions. Those results would not have been expected from Smedberg. As seen from the accompanying Declaration of Dr. Gardner, they are unexpected and surprising to him from his understanding of Smedberg.

Claims 6, 7, 16, 17 and 20 have been rejected as obvious from Smedberg and the asserted admitted prior art taken with Kato, the latter being cited as showing application of liquids by spraying or foaming. Reconsideration is requested.

Application of Kato to Smedberg, alone or taken with the background discussion in the subject application, does not make these claims obvious because Smedberg teaches a fundamentally different process, using fundamentally different binders, from the claimed process, as discussed above and established in Dr. Gardner's Declaration. Kato adds nothing that would lead persons skilled in the art from Smedberg's low viscosity hot melts to the claimed thermoplastic binders. Kato is even farther removed from Smedberg and the claimed process in its teaching of backcoats that are aqueous latex formulations that contain a crosslinkable resin, a plasticizer and expandable polystyrene particles and form a solid, foamed structure for bonding fabric plies. Its teachings of backcoat ingredients and of techniques for applying liquids to a fabric are irrelevant to both Smedberg and the claimed process.

Claim 8 has been rejected as obvious from Smedberg and the prior art the Examiner considers to have been admitted and Bogdany, the latter being cited for its disclosure to apply corn syrup to carpets as a froth. Reconsideration is requested.

Application of Bogdany to Smedberg, alone or taken with the background discussion in the subject application, does not make claim 8 obvious because Smedberg teaches a fundamentally different process, using fundamentally different binders, from the claimed process, as discussed above and established in Dr. Gardner's Declaration. Bogdany is even further removed, directed to use of corn syrup to stiffen conventional aqueous latex carpet backcoats. Bogdany is irrelevant.

Claims 5, 36 and 37 have been rejected as obvious from Smedberg taken with the prior art considered by the Examiner to have been admitted and Bieser et al. Reconsideration is requested.

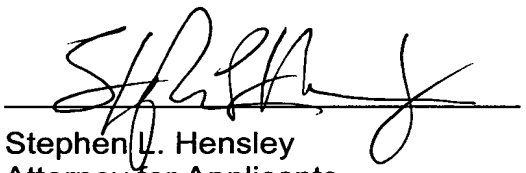
Application of Bieser et al. to Smedberg, alone or taken with the background discussion in the subject application, does not make these claims obvious because Smedberg teaches a fundamentally different process, using fundamentally different binders, from the claimed process, as discussed above and established in Dr. Gardner's Declaration. Bieser et al.'s homogeneously branched ethylene polymers are not substitutable for Smedberg's hot melt adhesive backcoats because their viscosities are too

high. Furthermore, and as discussed in response to rejections based on Bieser et al. in the prior office action, that reference itself distinguishes hot melt adhesive lamination processes as in Smedberg, specifically noting that their melt strengths are too low for application by extrusion at page 5 lines 19-28. Bieser et al. also teaches the use of aqueous dispersions with its homogeneously branched ethylene polymers but both their viscosities and application rates are higher than those of the stitch bind compositions according to the claims. The specific teachings of Bieser et al. noted at page 11 of the outstanding action are irrelevant in view of these fundamental differences among it, Smedberg and the claimed process.

Conclusion

In view of the amendments made herein and the foregoing reasons for reconsideration of the rejections and the accompanying Declaration of Dr. Gardner, it is submitted that the claims of the subject application are clearly nonobvious from and patentable over the cited references and prior art considered by the Examiner to have been admitted, and that the application is in condition for allowance. Such action is respectfully requested.

Respectfully submitted,



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